

Influence of preventive measures to eradicate the spread of the Zika arbovirus

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Recently, the Zika arbovirus transmitted through the *Aedes aegypti* mosquitoes has been shown to be transmitted to humans, not only through vector transmission, but also through sexual contact. While there is a lot of research currently being conducted to find vaccines for the treatment of the disease, other methods of prevention and eradication of the disease recommended by the Center for Disease Control and Prevention include using insecticide treated bed nets (ITN) and indoor residual spraying (IRS). The ITNs developed using chemicals such as pyrethroids, can maintain effective levels of insecticide for a long time as well as repel mosquitoes. Since the mosquitoes tend to rest inside houses after biting humans, IRS applied to homes that do not have adequate screening or air conditioning is recommended. Also, exposure to insecticides reduces the mosquito density and lifespan of individual mosquitoes which in turn helps to reduce disease transmission. In this work, we investigate an enhanced mathematical model that incorporates ITNs and IRS as methods for eradication of Zika. Specifically, we develop an ordinary differential equation system that builds on classical SEIR epidemiological models, with added constraints for the two preventive measures, namely ITN and IRS. We derive the basic reproduction number analytically and compute the final size for the epidemic for various conditions involving ITNs and IRS numerically. We present ranges for combination of compliance and efficacy for ITNs and IRS that can potentially eradicate the disease.